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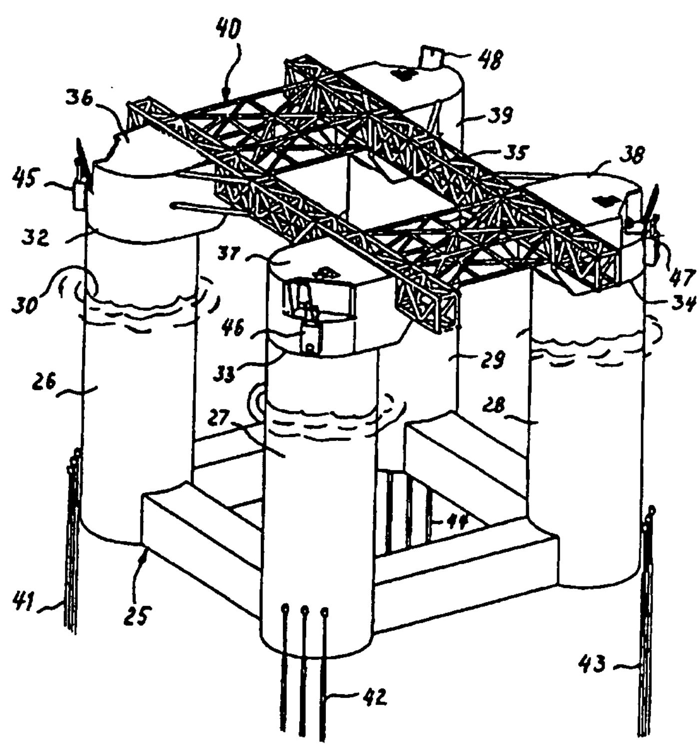
(54) Title: A FLOATING DEVICE

(57) Abstract

A floating platform constructed of a combination steel/concrete. The platform has a hull or submerged buoyancy section (25) of concrete, from which concrete columns protrude upward (26, 27, 28, 29). The columns continue as steel columns (36, 37, 38, 39) up to a deck section (40) of steel. The steel columns are built separately and can be fully equipped before they are mounted upon and secured to the concrete part.



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A floating device

The invention relates to a floater, having a submerged buoyancy section of concrete, a column section comprising one or a plurality of concrete column(s) protruding up from the buoyancy section, and a deck section of steel supported above the surface of the water by the column section, said one or said plurality of concrete column(s) being extended to the deck section as a hollow steel column ready for equipment.

A floater is an installation floating on the sea for the purpose of exploiting the resources in and below the ocean. It may be dynamically positioned or anchored. Typical floaters are maritime installations such as drilling platforms, production platforms, loading buoys, etc.

It is natural that weight and stability are problems encountered in connection with floaters. Thus, the tendency to enlarge the so-called topside (deck section) and otherwise place loads on high levels has become a steadily increasing problem. This is, inter alia, connected with unanticipated weight increases in deck structures and modules, a common experience during the process from initial design to the realized idea.

The stability and general movement characteristics of a floater are closely connected with the height of the material centre of gravity in interaction with the centre of buoyancy and the metacentre distance above the centre of buoyancy. Thus, the height of the metacentre plus the centre of buoyancy shall be defined positively greater than the height of the material centre of gravity if the floater is to achieve a satisfactory stability. It is thus clear that there will be great optimization gains connected with having the whole material centre of gravity lowered as much as possible. This also means that while the heavy structure of a concrete floater is an undisputed advantage with respect

to its bottom elements, the opposite will be true with respect to the upper part of the floater. A deck section formed as a steel structure contributes in a positive direction to stability.

When the choice is made of combining steel and concrete in floaters, as mentioned by way of introduction, the reasons are partly economic and partly technical. Concrete is competitive in terms of price and is believed to have several advantages in relation to steel. The relatively numerous and different types of installations constructed in the North Sea up till now have so far, with a minimum of maintenance and without special protection, proved highly resistant to corrosion. A concrete floater is therefore assumed to have an advantage in terms of durability. Another important advantage is the sturdiness of concrete structures, a feature believed to make them particularly well suited in highly weather-exposed maritime environments and for heavy deck installations.

Studies have shown that the interaction between steel and concrete is one of those design aspects that create problems. The problem arises when the considerable and concentrated static and dynamic loads between the deck section and the column section are to be transferred to the support in the concrete structure. These large concentrated loads may lead to a fracturing of the concrete, and such areas will in addition be highly exposed to fatigue. In order to have these forces distributed over a larger area and thus reduce the stress level in a satisfactory manner, it will therefore be necessary to reinforce the concrete by means of steel structures. However, such reinforcements result in a relatively large and undesirable increase in weight, particularly in view of the fact that the weight increase occurs high above the material centre of gravity, with concomitant adverse effects on stability.

The magnitude of these compressive loads will obviously depend upon the design, i.e., upon the size of the deck section and upon the principles and embodiment selected for the interaction between the underlying support system and the column section of the floater. It will thus be possible to reduce the magnitude of the concentrated compressive loads by a careful selection of design based solely upon this concern. However, such a selection will entail an obvious limitation of the possibilities of technical and economic optimization of a floater design.

It is an object of the present invention to propose measures which may contribute to improve the stability and general movement characteristics of a floater, while simultaneously making possible an optimization of construction and equipment time.

This object can be achieved by exploiting the advantages of concrete, with respect to sturdiness, heaviness and corrosion resistance, in the underwater, lower parts, i.e., the portion of the floater located below the surface of the water, in combination with the elasticity/plasticity of steel and its resulting, well documented stress levelling and distribution power, in all parts above the surface of the water.

According to the invention, a floater as mentioned by way of introduction is therefore proposed, characterized in that the dividing line between concrete and steel in the column is located at a distance from the deck support (the load's point of impact) where the concentrations of stresses from the concentrated loads on the deck support (the loads' point of impact) are distributed along the shell of the steel column to a low and relatively even level.

By means of the invention, the advantages of both steel and concrete can be exploited in a suitable manner, i.e., the area of ste l/concrete interaction is positioned in such a

way that optimal use can be made of the area where the forces are distributed.

The use of steel will contribute to weight reduction. At the same time the area of steel/concrete interaction will be advantageously moved, providing the opportunity for a desirable utilization of a certain area where forces are distributed, extending down along the columns. The distribution area should in principle extend as far down the columns as possible. In practice, the dividing line in a floater may advantageously be located at a distance in the magnitude range of 20 to 30 m from the deck support. For practical reasons the interaction level may preferably be located some distance above the surface of the water, partly to prevent exposure of the interaction area to high, external water pressure and thus a theoretical danger of leakage, and partly to secure access for maintenance and corrosion inspection, procedures considered essential since the floater may last as long as 50 years.

By employing the inventive idea, it is possible to distribute the considerable, concentrated compressive loads of the deck section via specially allocated reinforcement parts, constructed in steel, across to the cylindrical steel shell of the floater (the steel columns). From here, the compressive stresses will be spread further down the cylindrical steel shell in a fan-shape having a double angle of about 45°. Calculations show that both compressive stresses and the tensile stresses induced by eccentricity moments will range from an asymptotic infinite value at the load's point of impact, to a low, constant level at a distance approximately equal to the column diameter, from the top of the column and further down. Ideally, the interaction steel/concrete should therefore be placed at a reasonable, yet shortest possible, distance upward from this elevation. For a typical floater the column diameter will be about 25 m. According to the invention, the length of the steel column should

therefore be within the same magnitude range, at the same time as the concrete/steel connection should be located about 5 m above the anticipated water line, thus offering reasonable opportunities for periodic inspection and maintenance.

For a floater of said combined embodiment concrete/steel, two separate construction sites may be used, one for the concrete part and one for the steel part. These two construction sites will be able to work toward a common milestone (date) for the completion of the work. The use of steel columns is instrumental in reducing the time required for completing the project, a time reduction corresponding to the reduced work load with respect to the concrete portion.

Since it is assumed that all decks for various mechanical equipment will be enclosed inside the upper part of the column section, and these decks therefore are built, installed, equipped and in addition fully completed and tested, the work on the steel portion will be relatively extensive and time-consuming. The major portion of this manufacturing and completion period represents reductions in the total manufacturing period in relation to a uniform embodiment. The concrete/steel design saves a great deal of time in addition to offering the benefits of separated construction sites, such as better general access (availability of cranes, etc.) and more space per operator, circumstances which contribute to increased safety and a more efficient use of personnel and equipment, to a reduction in the number of work disciplines within a restricted area, which is of essential importance for productivity, and to less vulnerability to design changes late in the project since the production of the steel portion starts later than that of the concrete portion.

A floater according to the invention will also offer the advantage that the winches of the floater's anchoring system can be mounted in one or several of said steel columns.

Thus, this part of the anchoring system may be finished and ready for use as soon as the steel column is mounted. Typical anchoring systems for floaters are use of ordinary slack anchoring cables or tension stays.

Particularly in this connection it would be advantageous if the floater according to the invention comprised two diametrically opposed steel columns mounted in the column section, since this would make possible an anchoring system where only the two mentioned steel columns were equipped with the anchoring system of the floater's buoyancy section (winches, tension devices, etc.) Such a simplified anchoring system is assumed to have an independent inventive significance.

A floater according to the invention may have many different structural embodiments. Thus, the column section may advantageously consist of a number of closely grouped columns, an embodiment which might, for example, be especially appropriate for a floater planned as a loading buoy. In this connection, in particular, the floater according to the invention may have the type of design where the submerged floater section is incorporated in the column section. Moreover, the deck section may also be greatly reduced and simply consist of a top part of the column section. Thus, a floater according to the invention can conceivably be built as a maritime structure where the individual floater sections cannot, in terms of appearance, be distinguished from each other.

The invention shall now be further explained with reference to the drawings, in which:

Fig. 1 shows the mounting of a steel column on a concrete column,

Fig. 2 shows a perspective view of a possible

embodiment of a floater according to the invention,

Fig. 3 shows another possible embodiment of a floater according to the invention,

Fig. 4 shows a partly cross-sectional view of a steel column used in the floater of Fig. 3,

Fig. 5 shows, in an elevational view, the steel column in Fig. 4 mounted on the underlying concrete column,

Fig. 6 shows an enlarged section from Fig. 5, taken from the interaction area concrete/steel, and

Fig. 7 shows a corresponding section of a modified embodiment.

In Fig. 1 the upper terminating portion of a concrete column 1 is shown. This concrete column 1 represents a part of a floater and protrudes, as shown, up through the water surface 2. A steel column 3 is shown while being lifted into position on top of the concrete column 1 by means of two crane barges 4, 5.

The combined column 1, 3 may, for example, be one of the elements of the floater shown in Fig. 2. The floater in Fig. 2 is of a type where the submerged buoyancy section is incorporated in the column section, or vice versa, and no clear division thus exists between the submerged buoyancy section 6 and the floater's column section 7. A deck section 8 is indicated by dotted lines. This deck section may be of many different designs and may even be so small that it practically disappears, for example, in the case of a loading buoy existing only in the form of a helicopter platform or a suitable termination of the top of the column section.

The floater, as shown, is constructed of closely grouped columns 1, 9, 10 and 11. The concrete part is cast as a

continuous structure, here up to a level above the surface of the water 2, and then extends upward in the form of steel columns 3, 12, 13 and 14. The dividing lines between concrete/steel are indicated by reference numerals 15, 16 and 17.

A floater such as this may be constructed by using two separate construction sites, one for the concrete part and one for the steel part. The steel columns can be almost fully completed before they are mounted on the concrete columns (Fig. 1). Thus, each steel column may be finished with all its decks ready for various mechanical equipment, and the necessary equipment may also be placed in the steel columns prior to their installation in the floater. The slackly anchored floater in Fig. 2 will, as soon as the steel columns are mounted, have its anchoring system accessible. This means that the floater in Fig. 2, for example, in this case may have the necessary anchoring winches 18, 19 in its equipped steel columns 3 and 13, so that the suggested anchorage may readily be established by means of the slack anchoring cables 20 - 23. From Fig. 2 it is apparent that the anchoring system conceivably can be activated by using only two steel columns, diametrically mounted in the column section viz. the steel columns 3 and 13. Moreover, it is not required that all columns should have terminating steel portions, as in Fig. 2. Thus, when it is considered useful or suitable, steel columns 12 and 14 may be omitted, and the concrete columns 9 and 11 will thus be terminated at the dividing line 16 or possibly higher or lower than this dividing line. Such a group of columns may obviously also consist of a larger or smaller number, of separate or more or less fused, columns.

In Fig. 3 another possible embodiment of a floater according to the invention is shown, here in the form of a tension stay platform. The floater in Fig. 3 has a submerged buoyancy s ction 25 of concrete, designed as a frame structure (seen

in the plan view), having concrete columns 26, 27, 28 and 29 protruding from each corner of the frame. The concrete columns 26-29 extend through the surface of the water 30 up to a certain level 32, 33, 34, 35. From here, the individual column continues as a steel column 36, 37, 38 and 39. The steel columns carry supporting structures/framework 40 for supporting deck modules (not shown) and for binding the columns together.

As previously mentioned, the floater in Fig. 3 is a tension stay platform. The necessary tension stays are indicated by reference numerals 41, 42, 43 and 44, and the handling/tightening equipment for the tension cables is mounted in the respective steel columns. This equipment is in Fig. 3 indicated by reference numerals 45, 46, 47 and 48. The connection between the tension stays and the floater is not shown in further detail.

A typical steel column, as used in the floater in Fig. 3, is shown in Fig. 4 in partial cross section. As apparent from Fig. 3, the support structure 40 of the deck section is such that the support of the modules (not shown) of the deck section will be eccentric in relation to the centre line of the columns of the floater. Therefore, the steel columns have in this case a special design, a reinforcement bulkhead 50 being extended from the periphery of the column and a bulkhead 51 introduced parallel to this under the support system 40 (Fig. 3). Similarly, two parallel bulkheads 52, 59 are introduced between the bulkhead pairs 50, 51. These structural reinforcement parts will primarily function as elements for distribution of stress and moment from the support system 40 to the steel column. At the same time, these parallel bulkheads might be used as, for example, storage tanks for water and diesel oil, since they might be designed with considerable inner storage volume.

Moreover, it is seen from Fig. 4 that the required number of steel decks 54, 55 can be constructed inside the steel column.

In Fig. 5 the dividing line between concrete and steel is shown, and Figs. 6 and 7 show in detail a possible interaction between concrete and steel, the sections being taken from the section area 56 indicated in Fig. 5. In Fig. 5 the concrete column is indicated by reference numeral 27 (see also Fig. 3), and the steel column is indicated by reference numeral 37 (see also Fig. 3).

The interaction area which is shown in detail for two possible embodiment forms in respectively Figs. 6 and 7, comprises a thick steel plate 57 placed on top of and continuously around the upper part of the concrete column 27. Under the steel plate there are welded bolts of reinforcement steel or other types of bolts 58, which are embedded in the concrete. The number and dimensions of these bolts will depend upon existing tensile/compressive forces. Between the bolts there is welded a shearing plate 59 continuously around the circumference. This has the triple function of receiving and transmitting horizontal shearing forces, safeguard against water leakage and, additionally, being made of H-profiles, receiving and distributing vertical compressive/tensile forces. In Fig. 7 the connection is shown in an alternative embodiment, and the bolts are replaced by two plates of H-profiles 60.

It will be a definite advantage with respect to leakage protection to have the H-profiles and steel plate be a continuous welded connection around the whole circumference, but installing the elements in a continuous ring will creat technical problems in terms of handling. Sectors suitable for installation purposes should therefore be prefabricated, the sectors being collected and welded at a suitable distance

above the concrete edge, temporarily suspended, for example in pulleys. After the welding, the ring can be lowered into the final, accurately adjusted (levelled) position. The steel plate/top plate 57 may have suitably spaced holes for injection of (optionally epoxy-based) concrete. It will of course be possible to use other installation procedures to achieve circular continuity. The steel column 37 has, as apparent from Fig. 5, a somewhat smaller diameter than the concrete column 27. This difference has partly a reinforcement (concrete-technological) function, but it will also provide a spatial installation tolerance for the steel column in relation to the very strict building tolerances normally set.

The dividing line between concrete and steel in the column should ideally be positioned at a reasonable yet shortest possible distance upward, calculated from an elevation where the stresses which are due to the compressive loads from the deck section have reached a low, primarily constant, level. This elevation can be calculated, it being assumed that the compressive stresses spread down the cylindrical steel shell of the steel column in a fan shape. Based on an assumed stress distribution sector, and by using generally known formulae for compressive and tensile stresses as a function of a concentrated load and the thickness of the cylindrical steel shell in the steel column, it will be possible to set up a stress distribution diagram showing that both compressive stresses and the induced tensile stresses from eccentricity moments will range from an asymptotic infinite value in the load's point of impact to a low, constant level at some distance from the top of the column and further down. For a column top diameter of 25 m said distance will be approximately be equal to the diameter. Another second requirement which ought to be satisfied is to place the dividing line at a suitable height above the waterline of the structure, for example about 5 m above it, since such a placement will provide reasonable possibilities for inspection and mainte-

nance. This will be a great advantage since it is expedient to have the whole steel column accessible for inspection and maintenance even though the connection concrete/steel supposedly is sealed against leakage, taking into account that a floater can have a specified expected operational life of as much as 50 years.

By means of the invention, the advantages of the concrete version are exploited with respect to sturdiness, heaviness and corrosion resistance in the underwater, lower parts, i.e., those parts of the floater that are below the surface of the water, in combination with the elasticity/plasticity of steel and its resulting, well documented power to level and distribute stress, in all parts above the surface of the water. The stability and general movement characteristics are improved because the material centre of gravity is lowered as much as possible. It is also possible fully to exploit the advantage of having two building sites, including the particular advantage of having the steel parts fully equipped before the connection with the concrete structure is established.

The considerable and concentrated static and dynamic loads between the deck section and the column section will be distributed over a larger, suitable area, providing a very advantageous reduction of the stress level and a satisfactory interaction between steel and concrete.

Patent Claims

1.

A floater, having a submerged buoyancy section (6;25) of concrete, a column section (7; 26, 27, 28, 29) comprising one or a plurality of concrete column(s) protruding up from the buoyancy section, and a deck section (8; 40) of steel supported above the surface of the water by the column section, said one or plurality of concrete column(s) (1, 9, 10, 11; 26, 27, 28, 29) being extended to the deck section as a hollow, steel column (3, 12, 13, 14; 36, 37, 38, 39), ready for equipment,

c h a r a c t e r i z e d i n that the dividing line (15, 16, 17; 32, 33, 34, 35; 56) between concrete and steel in the column is located at a distance from the deck support (the load's point of impact) where the concentrations of stresses from the concentrated loads on the deck support (the loads' point of impact) have been distributed along the shell of the steel column to a low and relatively even level.

2.

A floater according to claim 1

c h a r a c t e r i z e d i n that the dividing line is located at a distance in the magnitude range of 20 to 30 m from the deck support.

3.

A floater according to claim 1 or 2,

c h a r a c t e r i z e d i n that the dividing line is located at a distance of about 5 m above the anticipated waterline.

4.

A floater according to claims 1, 2 or 3,

c h a r a c t e r i z e d i n that winches (18, 19; 45, 46, 47, 48) for the anchoring system of the floater (20, 21, 22,

23; 41, 42, 43, 44) are mounted on one or more of said steel columns (3, 13; 36, 37, 38, 39).

5.
A floater according to one of the preceding claims, c h a r a c t e r i z e d i n that it comprises two diametrically opposed steel columns mounted in the column section (3, 13; 36, 38; 37, 39).

6.
A floater according to one of the preceding claims, c h a r a c t e r i z e d i n that the column section consists of a number of tightly grouped columns (1, 9, 10, 11).

7.
A floater according to one of the preceding claims, c h a r a c t e r i z e d i n that the submerged buoyancy section (6) is incorporated in the column section (7, Fig. 2).

8.
A floater according to one of the preceding claims, c h a r a c t e r i z e d i n that the interaction area at the dividing line between steel and concrete comprises a horizontal annular steel plate (57) and an annular shearing plate (59) extending from the steel plate down into the concrete.

Fig. 1

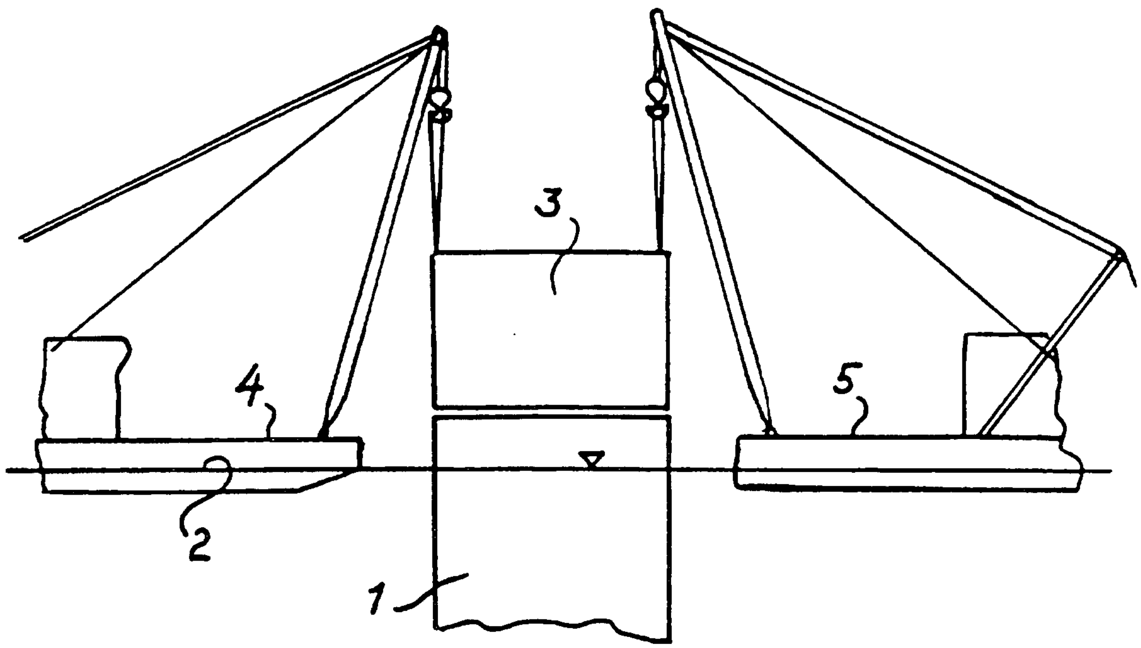


Fig. 2

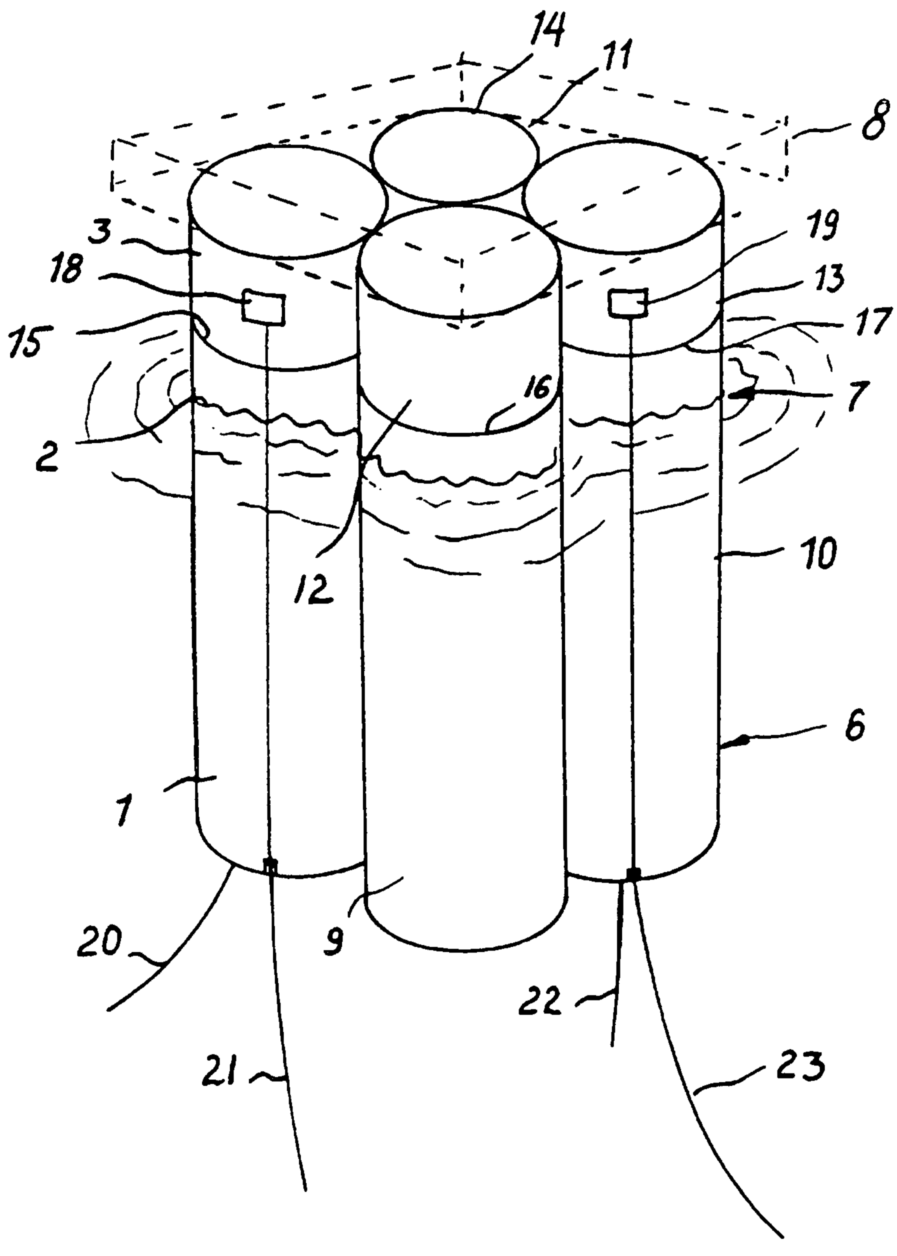


Fig. 3

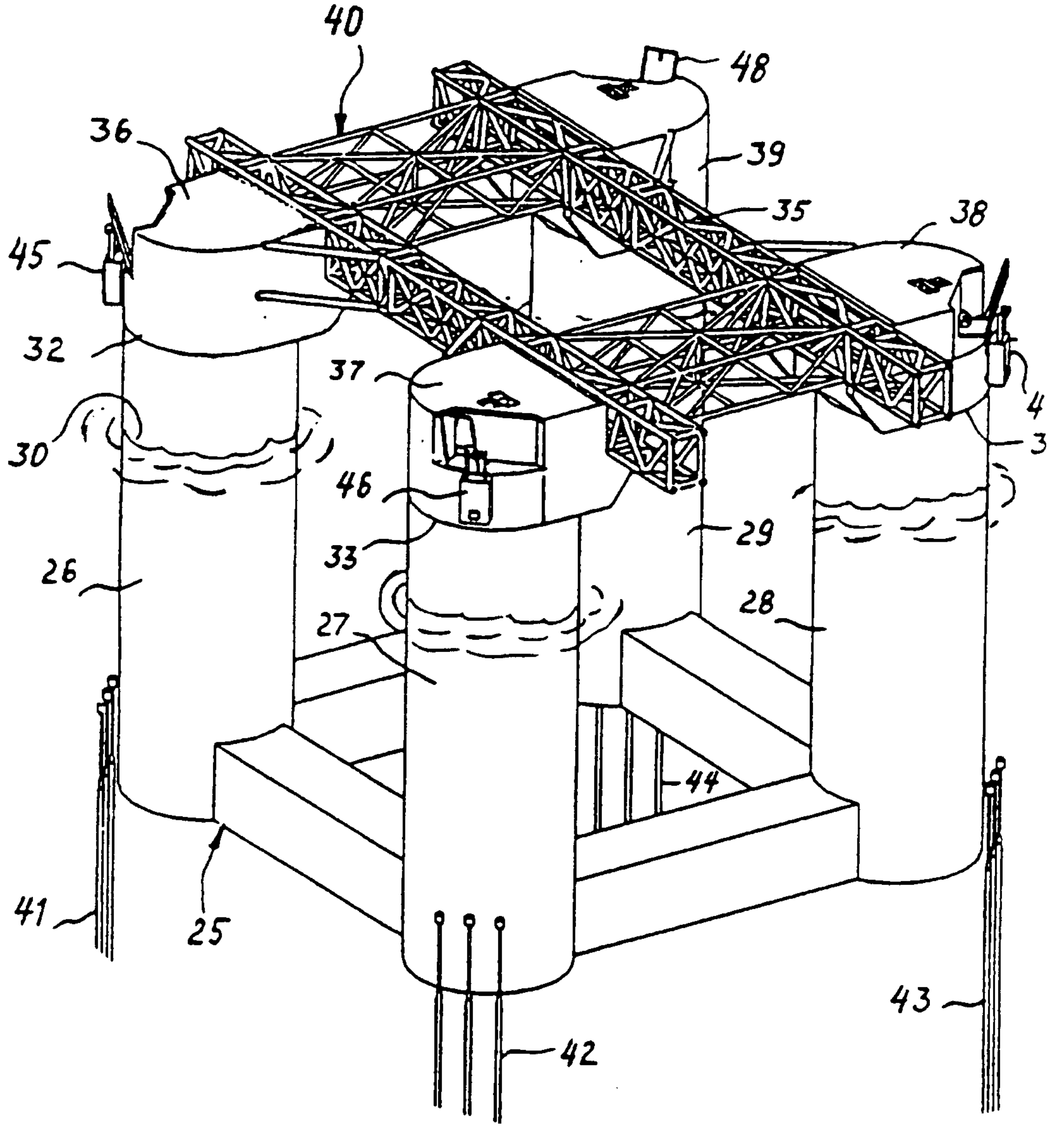


Fig. 4

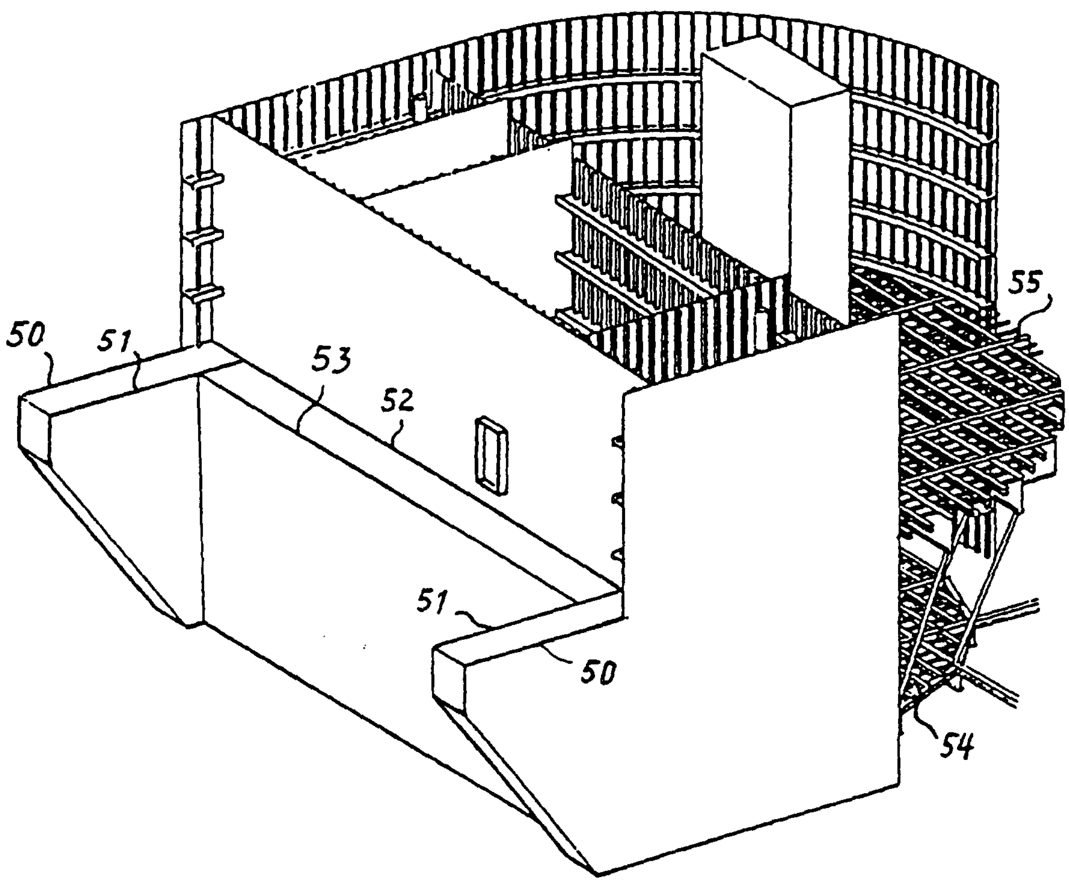


Fig. 5

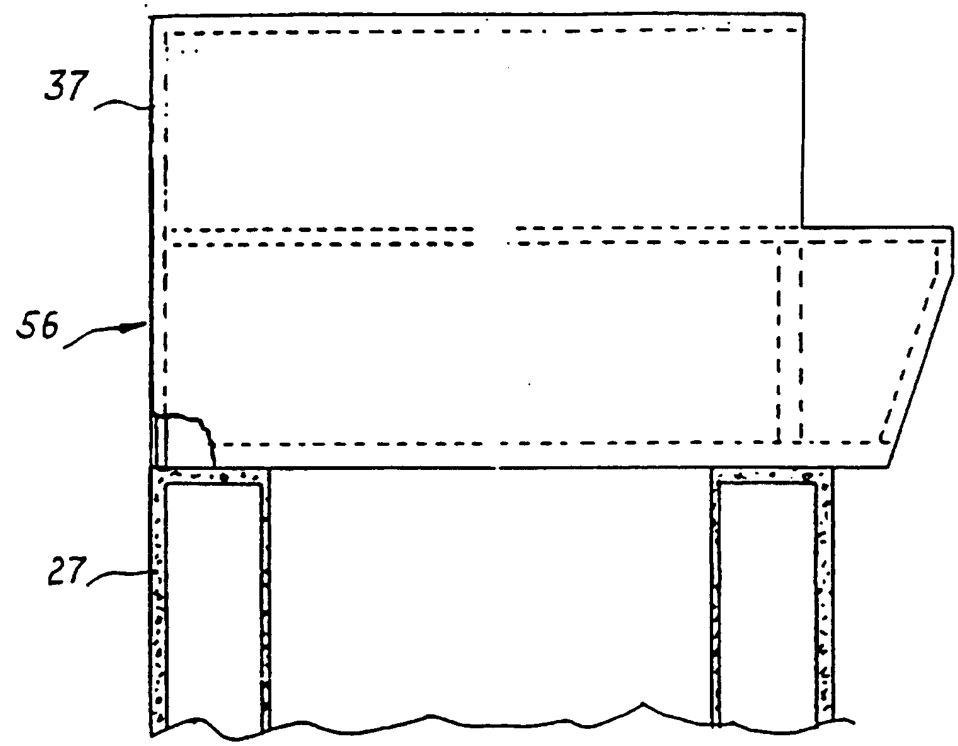


Fig. 6

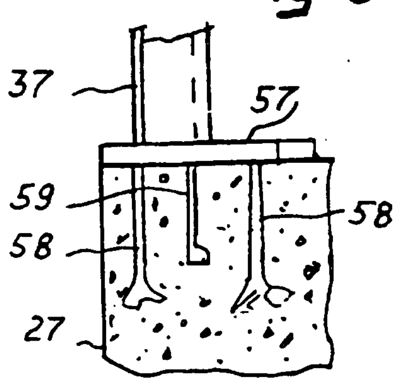
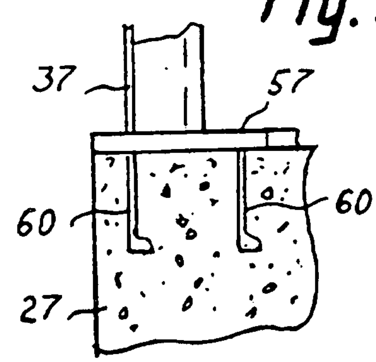


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 95/00023

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B63B 35/44
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

QUESTEL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2158397 A (JAN STAGEBOE), 13 November 1985 (13.11.85), page 2, line 83 - line 94, figure 1 --	1-8
A	GB 2259536 A (KVAERNER ROSENBERG A.S.), 17 March 1993 (17.03.93), page 7, line 1 - line 18; page 8, line 34 - page 9, line 12, figures 10-12 --	1-8
A	WO 8401554 A1 (KVAERNER ENGINEERING A.S.), 26 April 1984 (26.04.84), page 8, line 8 - line 21, figure 1 --	1-8
A	US 4202648 A (KVAMSDAL), 13 May 1980 (13.05.80), column 3, line 18 - line 22, figure 7 --	1-8

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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7 Sept 1995	21 -09- 1995
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Christer Jönsson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan, Vol 5,No 127, M-83, abstract of JP, A, 56-63589 (MITSUI ZOSEN K.K.), 30 May 1981 (30.05.81)	1-8

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INTERNATIONAL SEARCH REPORT

Information on patent family members

31/07/95

International application No.
PCT/NO 95/00023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2158397	13/11/85	CA-A- 1237903	14/06/88
		US-A- 4702648	27/10/87
GB-A- 2259536	17/03/93	NO-C- 173816	09/02/94
WO-A1- 8401554	26/04/84	AU-A- 2079083	04/05/84
		EP-A- 0122273	24/10/84
US-A- 4202648	13/05/80	DE-A- 2837227	15/03/79
		GB-A,B- 2003798	21/03/79
		JP-A- 54049789	19/04/79